

## **WHAT IS CLAIMED IS:**

1. A method for managing state variables for rendering primitives, comprising:
  - defining a plurality of memory areas for storing instructions and current state information associated with the primitives;
  - defining state variables associated with the primitives;
  - sorting state variables into a plurality of subgroups;
  - associating each of the plurality of memory areas with a plurality of tracking bits, wherein each tracking bit is associated with a subgroup and one of the plurality of memory areas;
  - setting the tracking bit in response to a change in a state variable since the primitive instructions were previously output to the memory areas; and
  - outputting current state information associated with the subgroup into one of the plurality of memory areas in response to the tracking bit being set.
2. The method of claim 1 further comprising:
  - clearing the tracking bit after the current state information has been output to the one of the plurality of memory areas.
3. The method of claim 1 wherein sorting state variables into a plurality of subgroups further comprises:
  - sorting state variables associated with basic state functions.
4. The method of claim 1 wherein sorting state variables into a plurality of subgroups further comprises:
  - sorting state variables associated with texture map functions.
5. The method of claim 1 wherein sorting state variables into a plurality of subgroups further comprises:
  - sorting state variables associated with texture blend functions.

6. The method of claim 1 wherein sorting state variables into a plurality of subgroups further comprises:
  - sorting state variables associated with slow state functions.
7. The method of claim 1 wherein setting the tracking bit in response to a change in a state variable since the primitive instructions were previously output to the memory areas further comprises:
  - determining whether a state change has occurred;
  - determining which subgroup is associated with the state change;
  - determining a new and previous value of the state variable; and
  - setting the corresponding subgroup tracking bit if the new and previous values differ.
8. The method of claim 1 further comprising:
  - defining a plurality of additional memory areas for storing state information;
  - defining a reference for the plurality of additional memory areas; and
  - storing selected state group information into the plurality of additional memory areas.
9. The method of claim 8 wherein outputting current state information associated with the subgroup into one of the plurality of memory areas in response to the subgroup being set further comprises:
  - outputting the reference associated with the subgroup into one of the plurality of memory areas when the tracking bit is set.; and
  - based on the reference, retrieving referenced information stored in one of the plurality of additional memory areas during rendering.
10. The method of claim 9 wherein storing selected state group information into the additional memory areas further comprises:
  - storing state variables associated with slow state functions into the plurality of additional memory areas.

11. The method of claim 10 wherein defining a reference for the additional memory areas further comprises:
  - defining a pointer to the additional memory areas where slow state information is stored.
12. An apparatus for rendering a scene including primitives, comprising:
  - a plurality of binning memory areas associated with regions that are intersected by primitives;
  - a tracking memory area for storing indicators of state variables that been affected since primitive instructions were previously output to the memory areas;
  - a binning engine, responsive to the tracking indicators, for binning current state information of state variables; and
  - a rendering engine for rendering the current information stored in the memory areas.
13. The apparatus of claim 12 wherein the current information comprises state variables that have changed since primitive instructions were previously output to the memory areas.
14. The apparatus of claim 12 wherein the current information comprises a reference.
15. The apparatus of claim 13 wherein the state variables are associated with at least one state group.
16. The apparatus of claim 15 wherein the at least one state group comprises basic state functions.
17. The apparatus of claim 15 wherein the at least one state group comprises texture map functions.

18. The apparatus of claim 15 wherein the at least one state group comprises texture blend functions.
19. The apparatus of claim 15 wherein the at least one state group comprises slow state functions.
20. The apparatus of claim 12 wherein the tracking information comprises a plurality of tracking bits wherein each tracking bit is associated with a binning memory area and a subgroup.
21. The apparatus of claim 12 wherein a tracking memory area for storing indicators of state variables that been affected since primitive instructions were previously output to the memory areas further comprises:
  - a tracking memory area for storing indicators of state variables that changed since primitive instructions were previously output to the memory areas.
22. The apparatus of claim 12 wherein a tracking memory area for storing indicators of state variables that been affected since primitive instructions were previously output to the memory areas further comprises:
  - a tracking memory area for storing indicators of state variables that were used since primitive instructions were previously output to the memory areas.
23. The apparatus of claim 14 further comprising:
  - a plurality of additional memory areas.
24. The apparatus of claim 23 wherein the plurality of additional memory areas stores slow state variables.
25. The apparatus of claim 24 wherein the reference comprises a pointer into the additional memory areas.

26. The apparatus of claim 25 wherein the binning engine, responsive to the tracking indicators, bins the reference in one of the plurality of binning memory areas.

27. The apparatus of claim 26 wherein the rendering engine utilizes the reference to retrieve slow state information from at least one of the plurality of additional memory areas.

28. A machine readable medium having stored therein a plurality of machine readable instructions executable by a processor to manage states for rendering primitives, the machine readable instructions comprising:

- instructions to define a plurality of memory areas for storing instructions and current state information associated with the primitives;

- instructions to define state variables associated with the primitives;

- instructions to sort state variables into a plurality of subgroups;

- instructions to associate each of the plurality of memory areas with a plurality of tracking bits, wherein each tracking bit is associated with a subgroup and one of the plurality of memory areas;

- instructions to set the tracking bit in response to a change in a state variable since the primitive instructions were previously output to the memory areas; and

- instructions to output current state information associated with the subgroup into one of the plurality of memory areas in response to the tracking bit being set.

29. The machine readable medium of claim 28 further comprising:

- instructions to clear the tracking bit after the current state information has been output to the one of the plurality of memory areas.

30. The machine readable medium claim 28 wherein instructions to sort state variables into a plurality of subgroups further comprises:

- instructions to sort state variables associated with basic state functions.

31. The machine readable medium of claim 28 wherein instructions to sort state variables into a plurality of subgroups further comprises:  
instructions to sort state variables associated with texture map functions.
32. The machine readable medium of claim 28 wherein instructions to sort state variables into a plurality of subgroups further comprises:  
instructions to sort state variables associated with texture blend functions.
33. The machine readable medium of claim 28 wherein instructions to sort state variables into a plurality of subgroups further comprises:  
instructions to sort state variables associated with slow state functions.
34. The machine readable medium of claim 28 wherein instructions to set the tracking bit in response to a change in a state variable since the primitive instructions were previously output to the memory areas further comprises:  
instructions to determine whether a state change has occurred;  
instructions to determine which subgroup is associated with the state change;  
instructions to determine a new and previous value of the state variable; and  
instructions to set the corresponding subgroup tracking bit if the new and previous values differ.
35. The machine readable medium of claim 28 further comprises:  
instructions to define a plurality of additional memory areas for storing state information;  
instructions to define a reference for the plurality of additional memory areas; and  
instructions to store selected state group information into the plurality of additional memory areas.
36. The machine readable medium of claim 35 wherein instructions to output current state information associated with the subgroup into one of the plurality of memory areas in response to the subgroup being set further comprises:

instructions to output the reference associated with the subgroup into one of the plurality of memory areas when the tracking bit is set.; and

instructions, based on the reference, to retrieve referenced information stored in one of the plurality of additional memory areas during rendering.

37. The machine readable medium of claim 36 wherein instructions to store selected state group information into the additional memory areas further comprises:

instructions to store state variables associated with slow state functions into the plurality of additional memory areas.

38. The machine readable medium of claim 37 wherein instructions to define a reference for the additional memory areas further comprises:

instructions to define a pointer to the additional memory areas where slow state information is stored.